REMARKS/ARGUMENTS

Claims 1-25 are pending. Claim 1 has been amended to more clearly claim the invention. Claims 5 and 6 have been amended for clarity. Support for the amendment to Claim 5 is found in the specification on page 7, lines 12-15. Other revisions have been made to make the claims consistent with U.S. practice. Accordingly, the Applicants do not believe that any new matter has been added.

The Applicants thank Examiner Drodge for the helpful and courteous interview of March 21, 2006. Possible amendments regarding selective separation of elements were discussed. The Examiner provided additional search results for the Applicants to consider in formulating a response.

Objections—Claims

Claims 10-25 were objected to as being improperly dependent. This objection is moot in view of the amendments above.

Rejection—35 U.S.C. §112, second paragraph

Claims 1-9 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. This rejection is moot in view of the amendments above.

Rejection—35 U.S.C. §103

Claims 1-9 were rejected under 35 U.S.C. 103(a) as being unpatentable over Bohlmann et al., U.S. Patent No. 2,897,046, in view of Fortress et al., U.S. Patent No. 2,572, 128, Nease et al., U.S. Patent No. 4,595,529 and Nemoto et al., U.S. Patent No. 5,523,515.

Independent Claim 1 is directed to a method for separating chemical elements from each other based on the use of two different extractants:

- a first extractant which is capable of co-extracting chemical elements E1 and E2 from the aqueous solution in which they are initially present into the organic phase containing said extractant, and
- a second extractant which is capable of selectively retaining chemical element(s) E2 in the organic phase when chemical element(s) E1 is(are) stripped from said organic phase by means of an aqueous solution.

Furthermore, the method of the invention features a cyclic method in which each cycle:

* uses a single organic phase,

* begins by a co-extraction step in which this organic phase only contains the first extractant;

* comprises, after said co-extraction step, a step consisting in adding the second extractant to the organic phase, and

ends by a step which consists in separating the first and second extractants from each other in order to re-use them in a subsequent cycle.

The cited prior art does not disclose or suggest this method for the following reasons:

Bohlmann (US 2,897,046) discloses a process for separating thorium from uranium in which

- thorium and uranium are co-extracted from a nitric aqueous phase having a HNO_3 concentration higher than 3N by means of an organic phase containing a single extractant, namely tri-n-butyl phosphate (TBP);
- thorium is then stripped from the organic phase by means of a nitric aqueous phase having a HNO_3 concentration lesser than 3N; and

- uranium is then stripped from the organic phase by means of water.

Bohlmann does not disclose or suggest the use of a second extractant capable of selectively retaining uranium in the organic phase when thorium is stripped, which is recognized by the Examiner. *A fortiori*, Bohlmann cannot disclose or suggest adding a second extractant to the organic phase at a step different from the step aiming at co-extracting thorium and uranium from the nitric aqueous phase, and separating said second extractant from TBP in order to re-use them in a subsequent cycle.

Fortress (US 2,572,128) is non-analogous art since it relates to a process for concentrating dilute lower aliphatic acids by extracting said acids with a solvent mixture containing a trialkyl phosphate such as TBP together with a hydrophobic diluent able to form with water an azeotrope having a boiling point below the boiling point of the acids.

Moreover, the Fortress process differs substantially from the claimed process for the following reasons:

1°) the process of Fortress consists in concentrating aliphatic acids by separating them from water but in no case in separating aliphatic acids from each other unlike the method of the invention which allows separating different chemical elements present in the same aqueous solution from each other;

2°) aliphatic acids are compounds and not chemical elements (see the attached technical definitions).

Furthermore, the Official Action is incorrect in stating that Fortress teaches at column 2, line 51-column 3, line 20 to add extractants (note the plural) and diluents (also note the plural) in succession or in successive stages (see page 4, 2nd section of the Office Action).

In fact, in the passage cited in the Official Action, Fortress teaches:

- on the one hand, that the required amount of hydrophobic diluent may be present in the solvent mixture during the extraction, or a portion thereof may be added to the solvent mixture after the extraction but before the distillation, or even after the distillation has commenced, and
- on the other hand, that the extraction of the dilute lower aliphatic acids with the solvent mixture may be carried out on a batch basis or in a continuous manner, in a single stage or in a plurality of stages with concurrent or counter-current flow of the two phases in a manner well known in the art.

Thus, Fortress only teaches that the hydrophobic diluent may be used either in one go or in two goes and that the extraction may be carried out either in a single stage or in several stages, which has nothing to do with the use of two different extractants as achieved in the method of the invention.

Furthermore, the Official Action makes no distinction between an extractant and a diluent. However, as shown by the attached documents (see notably the definition of the IUPAC Gold Book), a diluent is defined in the field of the solvent extraction as a liquid or a homogeneous mixture of liquids in which the extractant is dissolved to form the solvent phase, but which by itself does not have any extracting property. Accordingly, a diluent cannot be equated to an extractant and an extractant cannot be equated to a diluent.

Neace (US 4,595,529) relates to a process for removing degradation products (i.e. products resulting from the degradation of TBP and from the degradation of the diluent) from a spent extraction solvent having been used in a PUREX process. In this process, the spent extraction solvent is washed with a wash solution containing water and at least one highly-polar water miscible organic solvent such as methanol or ethanol in which the degradation products dissolve. Then, the highly-polar water miscible organic solvent (containing the degradation products) is separated from the extraction solvent. Thus, Neace has nothing to do with the separation of chemical elements from each other by the use of two different extractants as achieved in the method of the invention.

Similar remarks apply to Nemoto (US 5,523,515) which relates to a process for purifying a spent solvent containing TBP and its degradation product DBP and an organic diluent, in which TBP and DBP are separated from the diluent by crystallization.

Accordingly, as the cited prior art does not disclose, suggest or provide a reasonable expectation of success for the invention set forth by independent Claim 1, the Applicants respectfully request that this rejection be withdrawn.

CONCLUSION

In view of the above amendments and remarks, the Applicants respectfully submit that this application is now in condition for allowance. An early notification of such is respectfully requested.

Respectfully submitted,

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